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REVISITING DEVELOPMENT OF THE GREEN BOND MARKET: EVIDENCE OF THE AHP APPROACH

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Abstract

Green bonds (GBs) are a fresh and applicable financial instrument introduced with the purpose of funding environmental projects. In the last years, the development of GBs has shown that this is an effective investment channel for the purpose of protecting the environment. Viet Nam is an Asian economy that has been trying to establish and develop a GB market. The aim of this study is to find out what are the most important factors influencing development of the GB market in Viet Nam. To this end, we use the analytic hierarchy process to analyze the opinions of experts. The main results reveal that the most important influencing factors are the legal framework for GB operations, monetary policies of Viet Nam's central bank, and the official interest rate of GB. In other words, infrastructural and economic factors are the most important requirements to develop the current GB market in Viet Nam. We recommend establishing green regulations and green economic policies in the country to support the implementation of GBs in Viet Nam.

Keywords: sustainable development, green bond, analytic hierarchy process

JEL Classification: N0, N10, O10, O23

Contents

1. INTRODUCTION

Green bonds (GBs) have been widely applied all over the world and are considered a financial tool to raise capital for projects that benefit the environment (World Bank 2019). The money raised by GB issuance is committed to investment in programs which enhance adaptation and lessen the effects of climate change, including projects about clean energy, public transport, and clean water.

The GB concept was proposed by the World Bank in the Strategic Framework on Development and Climate Change in 2008 as a solution to help countries around the world raise capital for strategies to solve the problem of air pollution and global climate change (Trang 2015). International Capital Market Association in the 2016 report of The Green Bond Principles (GBP) define GBs as any type of bond whose proceeds from bond issuance are used to finance different projects related to green energy sources which are eligible for funding and comply with the four principles of the GBP. Potential projects can be funded by GB mobilization, according to GBP, including (but not limited to) areas such as green energy sources, intensity of energy in societies, waste disposal, animal conservation, environmentally friendly transport, sustainable management of natural resources, and projects related to environmental problem adaptation. Generally, GBs are a kind of debt security having a number of common bonds characteristics and can help governments to attract capital for projects that benefit the environment. According to the definition by the International Capital Market Association (2016), GBs are bonds issued to raise funds for the government, banking, and local or issuing businesses, labeling GBs by governments as debt securities including securitization, private issuance, and guaranteed bonds.

The characteristic which separates GBs from other common bonds is that the purpose of GB mobilization is to fund special environment-related projects, including environmental projects and projects with environmental benefits. In addition, because of the purpose of the capital, GBs have a number of special provisions in terms of debt repayment mechanism, and recourse or nonrecourse of issuing organizations. GBs are only different from other types of bond on two basic points: (i) the proceeds after subtracting the costs related to the offering are used to finance or refinance green projects, environmental projects, or projects with environmental benefits; and (ii) there are different provisions in terms of debt repayment mechanism, and recourse or nonrecourse of issuing organizations.

GB development is beneficial for bond issuers, investors, and society. With regard to issuers, the issuance of GB in the stock market will help to diversify investors, especially investors who are interested in special aspects such as corporate governance and social factors in the process of investing. With regard to investors, GBs will be a good financial asset for investment to help diversify investment portfolios, disperse risks, and find appropriate resources. According to the trend that countries are focusing on sustainable development and greening the economy, the GB market will constantly increase in terms of both quantity and quality. Therefore, this will be a kind of asset that is highly appreciated, stable, and has good liquidity with long maturity. With regard to society, GBs are also an effective tool to raise investors' awareness about projects which deal with climate change and environmental pollution. At the same time, the issuance of GBs will help to attract large capital flows in society to support the implementation of environmentally friendly projects and meet social responsibility goals, contributing to sustainable development in the future.

According to the above advantages of GBs, Viet Nam's government is trying to develop this kind of bond in the country. The purpose here is to ascertain what factors can impact on GB market development in Viet Nam. This will be investigated using the analytic hierarchy process (AHP), a method that enables us to gather different experts' opinions, analyze, and rank factors influencing GB market development in Viet Nam.

Based on the freshness of the green bond issue in academic sectors and the knowledge of the authors, there has been no serious academic study focusing on analyzing different factors influencing GB market development, particularly in Viet Nam via a multi-criteria decision-making model. This gap is filled by the novelty of our research.

The structure of the rest of the paper is as follows. Section 2 offers a brief literature review. In Section 3, a number of earlier empirical studies are represented. Section 4 presents the research methodology. In Section 5, the results of the AHP are stated. We conclude the paper in Section 6.

2. LITERATURE REVIEW

2.1 The Green Bond Market in Southeast Asian Countries

The Association of Southeast Asian Nations (ASEAN), with an economic size of $2.57 trillion in 2016, is one of the largest economic groups in the world. The GB market in ASEAN has developed rapidly, indicating the expanded role of this kind of bond in the financial markets of ASEAN. The following Table 1 represents the GB issuance characteristics in 2018.

Table 1: GB Issuance in ASEAN Countries

Group of Countries	Share of GB Market in Financial Markets (%)	Number of GB Issuers	Value of Total Issued GB ($ billion)
ASEAN	6	19	5
Asia and the Pacific (APAC)	17	206	108
ASEAN share of APAC	35	9	5
ASEAN share of global	11	3	1

Source: Authors' compilation from https://www.climatebonds.net/.

Historically, issuance of GB was started by development banks in 2007–2008 in order to expand the financing of projects related to emissions reduction projects. Asia and the Pacific's GB issuers began their activities in the market in 2013, and in recent years their contribution to world GB issuance has been nearly 22%.

In recent years, there has been vast diversification in the GB market in ASEAN, and in 2016 Asia Pacific Renewables was ranked first among GB issuers in the region, with nearly $226 million of GB. This top ranking of ASEAN GB issuers is a guarantee of their efficient work and activities in local, regional and global financial markets.

GB issuers from Singapore and Malaysia entered the market in 2017, expanding the financial turnover in the GB market. In addition, GB issuers from Indonesia and Thailand joined this market in first and second quarters of 2018, respectively. Indonesia's issue of $1.25 billion of green Sukuk bonds in 2018 was significant in this country becoming the fifth most influential nation in the GB market. Interestingly, the major GB

issuers are non-financial institutions in the region, owning nearly 30% of the total GBs issued in this region. Moreover, green loans (GLs) are an important complementary part of GB (for instance, GLs are common among Singaporean real estate companies), being a major feature of the ASEAN bond market. The issue volume of GLs in ASEAN is $1.1 billion which is equal to approximately 22% of the aggregate transactions volume in the region.

In regard to the question of which country contributes more to the ASEAN GB market, Indonesia (TLFF I is the largest GB issuer of this country) is the first contributor and provides nearly 40% of total GB issuance in ASEAN. The second and third contributors are Singapore (the only GB issuer being Sindicatum Renewable Energy Company) and Malaysia, with shares of 35% and 19%, respectively.

The next important GB issuers in the region are Philippines, Thailand, and Viet Nam. Despite major contributions of different members of ASEAN, it is clear that the number of GB issuers in the region is quite a few.

Overall, it is clear that GB issuing has attracted the attention of financial sectors in ASEAN and has developed rapidly in the last decade. It seems that the ASEAN region can be considered one of the main GB markets in the world, where the issuance and use of GBs have a significant share in total bond markets.

2.2 The Green Bond Market in Viet Nam

The province of Ba Ria-Vung Tau and Saigon (Ho Chi Minh City) are the first two places in Viet Nam where the Vietnamese Dong (VND)-denominated GBs are represented on the Hanoi Stock Exchange. In Viet Nam, climate change has increased the level and the cycle of natural disasters such as droughts, floods, and sea level rise, seriously affecting the socio-economic development and people's lives. Research by international organizations also indicates that climate change could cost Viet Nam $15 billion per year, equivalent to 5% of GDP. Vietnamese authorities also estimate that each one-meter rise in the sea level will affect the lives of about 20% of the population. Flooding and saline intrusion due to sea level rise will narrow the area of agricultural land in both the Red River Delta and the Mekong River Delta. Industries will also be affected because of a shortage of raw materials and energy, leading to higher production costs. In this context, Viet Nam determines that green growth is an important strategy for sustainable development. Pursuant to Resolution No 24-NQ/TW of 3 June 2013 of the 11th Central Committee about being active in response to climate change, improvement of natural resource management, and environmental protection, on 20 October 2015, the Minister of Finance issued Decision 2183/QD-BTC approving the road map of the financial sector in Viet Nam to conduct the national strategy on green growth toward 2020. Accordingly, the Decision clearly stated the formulation and improvement of the financial policy framework to develop the green capital market and green financial products. Green capital market policies include setting up a green financial framework for activities on the capital market such as issuing regulations and conditions for stock listing (green listing), reporting (sustainable reporting), and monitoring (green financial criteria); mobilizing funds to invest in green growth through capital markets for green businesses, projects, and products through listing and issuing green stocks; issuing bonds and investment certificates for green projects, programs, and fields; developing green indicators for monitoring, evaluating, and trading on capital markets; issuing regulations or guidelines on environmental and social risk management for market organizations and for market members who are financial institutions and listed businesses.

After a period of application, the GB concept was officially recognized in 2018 in Item 1, Article 21, Decree 95/2018/ND-CP. Accordingly, "Green bonds are government bonds issued for raising funds for environmental projects as defined in the Law on environmental protection (also called green projects) and included in the list of projects to which public investment funds are allocated in accordance with the Law on public investment and the Law on state budget." Defined GB products include: (i) green corporate bonds, issued for green projects or green products; and (2) government bonds and local government bonds, issued for green goals, programs, and projects. In order to develop an open bond market and approach international standards, on 14 August 2017, the Prime Minister issued Decision No. 1191/QD-TTg approving the bond market development road map during 2017–2020, as a long-run approach toward 2030. Accordingly, the decision sets out the development viewpoints: develop the bond market both extensively and intensively, ensuring systemic safety, gradually approaching international practices and standards and modernizing the market's infrastructure, thus turning it into a crucial channel for raising medium- and long-term capital at reasonable capital costs; continue focusing on expanding the government bond market as a useful tool to grow the bond market; and further develop the corporate bond market to create favorable conditions for enterprises to raise capital, especially medium- and long-term capital, thereby enhancing their corporate governance and information disclosure. The objectives are that the outstanding balance of the bond market will reach around 45% of GDP by 2020 and 65% of GDP by 2030, and the outstanding balance of the market of corporate bonds will reach about 7% of GDP by 2020 and around 20% of GDP by 2030. The Ministry of Finance shall assume prime responsibility; the State Bank of Viet Nam shall coordinate with the Ministry of Planning and Investment to promulgate mechanisms and policies aiming to develop the GB market to create favorable conditions for issuing entities to mobilize capital through bond issuance to implement green projects. The policy of sustainable and environmentally friendly economic development was guided by the Party and the Government in Resolution No 24-NQ/TW, dated 3 June 2013 of the 11th Central Committee; Decision No. 1393/QD-TTg, dated 25 September 2012 approving the national strategy on green growth; Decision No. 403/QD-TTg, dated 20 March 2014 on approval of the National Action Plan on green growth in Viet Nam for the period of 2014–2020; and Decision No. 2053/QD-TTg, dated 28 October 2016, promulgating the action plan for implementing the Paris Agreement to combat CO_2 emissions.

In Decision No. 1191/QD-TTg, dated 14 August 2017, explaining the road map of bond market expansion over the period of 2017–2020 as a main part of the long-run approach of 2030, the Prime Minister assigned the task of developing the GB market to create favorable conditions for issuing entities to mobilize capital through bond issuance to implement green projects. Implementing the party and government guidelines in the above documents, the draft Decree states that GBs are a type of government bond, complying with the issuance process of government debt tools for the purpose of using the capital from GB issuance for green projects; every year the issuer has to report the use of capital for green projects and assess the environmental impacts. On 6 August 2015, the Governor of the State Bank of Viet Nam issued Decision No. 1552/QD-NHNN on issuance of the banking sector's action plan to implement the national strategy on green growth toward 2020. However, for a developing country like Viet Nam, the national budget is still tight and the support of international organizations is limited, and so the active participation of the financial system in the greening campaign of the economy plays a very important role. According to the United Nations Environment Programme (UNEP 2016), an eco-friendly economy (green economy) is an economy aimed at improving people's happiness and social justice, and significantly reducing the risk of environmental degradation. A green economy is an economy where people are

the center and policies create new resources, such as the Financial Monetary Market Policy, dated 24 August 2016, on sustainable and equal economic growth. Green growth is a development model that focuses on improving the quality of growth, changing the production structure and consumption in a sustainable way, and improving people's lives, combating carbon emissions and raising adaptability to the threat of global warming (UNEP 2016).

3. EMPIRICAL STUDIES

Finding an efficient solution to the problem of global warming and air pollution has attracted the wide attention of scholars. Using new financial tools is proposed as a way to move and shift from the current position to a better eco-friendly (green) economy.

Monasterolo and Raberto (2018) discuss that fiscal and monetary policies can present a new financial tool to reach the goals of the Paris Agreement. Using a developed flow-of-funds behavioral model they determine the significant impact of the investment of companies on the brown and eco-friendly sectors, on the unemployment rate in society, and on credit and bond markets. They conclude that green public policy is an appropriate way to ensure green growth by affecting the activities of credit markets.

According to the study by Wang and Zhi (2016), green finance is a fresh financial method for connecting environmental goals with economic growth. The authors study the current status of green finance in the field of renewable energy and find some shortcomings, proposing some solutions for market mechanism development and policy formulation. Showing the internal conflicts between green finance and environmental protection, the authors propose practical solutions to achieve a better ecological balance.

Catalin Voica, Panait, and Alin Haralambie (2015) believe that climate change has negative impacts to a large extent on the activities of economic actors. Gradually, companies and public institutions have recognized the need to adapt to new climate conditions, leading to the adoption of environmentally friendly behaviors and the promotion of socially responsible strategies. The authors evaluate the role of private investors and public agencies in green investment, mainly in the infrastructure and the government, creating the legal and institutional framework to encourage direct investors and portfolios in this area.

According to Flaherty et al. (2017), funding projects related to the mitigation of carbon dioxide and adopting various policies is an important program in the current decade. The authors state that a vast number of eco-friendly projects have failed due to lack of financing. Hence, strengthening green projects' financing would be a useful way to conduct efficient policies.

Sachs (2014) proposes sharing the interdisciplinary burden, showing that the implementation of climate policies has a positive relationship with the Pareto improvement strategy in both the short and long run. According to the author, the GB proposal represents an opportunity that can be carried out immediately to begin the Sachs plan: GB issuance can finance essential projects in decarbonizing so that debt can be paid through long-run programs. Since future generations will benefit from lowering the threat of climate change, they are a better candidate to pay the debt.

Megwai, Njie, and Richards (2016) investigate the role of national strategies and policies in green economic improvement in selected developing countries. The major findings of the study reveal that there are specific dissimilarities in national strategies from country

to country for reasons such as level of development, institutional capacity, government management, and the efficiency of production inputs. The authors recommend conducting the '6Is' policy in some selected UN member states, namely Croatia, Ethiopia, Kenya, Thailand, and Guyana.

Aksorn and Charoenngam (2016) attempt to analyze life cycle management through the process of community infrastructure development by applying a triangulation technique in the case of Thailand. They find that establishing a green finance infrastructure is a major key to develop green economy aspects in Thailand.

Routroy and Kumar (2016) focus on the green capability to improve the manufacturing supply chain cycle. The increased complexity of manufacturing supply chains is the main obstacle to the efficiency of different solutions for transition from common manufacturing supply chains to green manufacturing supply chains. Therefore, policy makers should try to find a process to improve the role of green capacities in the transition progress.

Jasim and Paramasivan (2017) study the problem of green marketing and the green supply chain in Tamilnadu coastal areas. They find that the most important reason for a lack of development in green marketing and the green supply chain in the areas is infrastructure, which can be improved by funding green projects.

Bekhet and Harun (2018) examine the causal relationship between renewable electricity generation and some macroeconomic variables in Malaysia over the period 1980–2016. Their findings show a long-run relationship running from labor and non-renewable electricity generation to renewable electricity generation. Furthermore, they find the negative short-run effect of capital, GDP, and financial development on renewable electricity generation. The study concludes that in Malaysia, it is recommended to improve the progress of sustainable energy security by managing the determinants influencing renewable electricity generation.

4. METHODOLOGY

In this paper, in order to determine the importance of various factors influencing GB market development in Viet Nam, we employ the AHP method, which has been used by numerous scholars as a reliable multiple criteria decision-making tool (Rasoulinezhad 2009; Jabalameli and Rasoulinezhad 2012). The main purpose of this method is to use qualitative data and shape them to quantitative ones. The scale of AHP ranges from 1 to 9, as shown in Table 1.

Table 2: Scale of AHP for Pairwise Comparison (Saaty 2000)

Relative Intensity	Definition	Explanation
1	Of equal value	Two requirements are of equal value
3	Slightly more value	Experience slightly favors one requirement over another
5	Essential or strong value	Experience strongly favors one requirement over another
7	Very strong value	A requirement is strongly favored and its dominance is demonstrated in practice
9	Extreme value	The evidence favoring one requirement over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between two adjacent judgments	Compromise is needed

To conduct the AHP method, we follow the steps below.

1. State the main problem, which is GB market development in Viet Nam in this study.
2. Determine the framework of the problem based on all actors and objectives.
3. Identify the criteria related to GB market development
4. Use the hierarchy structure to design the relationship between purpose, criteria, and factors.
5. Do pairwise comparisons to evaluate the weights of criteria and factors. To this end, we asked ten Asian experts in the University of Tehran to conduct comparisons.
6. Carry out calculations to find the maximum Eigenvector value, consistency index (CI), consistency ratio (CR), and normalized values for each criterion.

$$\lambda_{max} = \frac{1}{n}\sum_{i=1}^{n}\left\{\frac{\sum_{j=1}^{n} a_{ij} * w_j}{w_i}\right\}$$

Here, λ_{max} indicates the maximal or principal Eigenvector and n shows the matrix size; a_{ij} denotes an element of the pairwise comparison matrix; w_j and w_i represent the jth and ith element of values of the Eigenvector, respectively.

$$CI = \frac{\lambda_{\max} - n}{n -}$$

$$CR = \frac{CI}{RI}$$

RI represents random indices.

To evaluable the acceptability of the CI, it is necessary to calculate the CR. Random indices are given in Table 3 (Saaty 2000). As a general rule, a CR of 0.10 or less is considered acceptable.

7. As a rule, if the maximum values of the Eigenvector, CI, and CR are satisfactory, then a decision is made based on the normalized values; otherwise the last procedure is conducted again till these values are in the desired range. The CIs in our research are measured using Expert Choice software.
8. If CI>0.1, then we can interpret relative weights of factors and conduct global ranking of factors related to the goal.

Table 3: The Consistency Indices of Randomly Generated Reciprocal Matrices

	Order of the Matrix														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
RI value	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

Source: Saaty (2000).

5. AHP RESULTS

5.1 Step 1: GB Market Characterization

In this step, the main objective of our model is defined as GB market development in Viet Nam. Seven criteria and factors associated with each criterion were finalized by the group of experts, as listed in Table 4.

Table 4: Hierarchical Structure of Our Model

Objective	Criteria	Factors
Green bond development in Viet Nam	A: Economic	A1: Inflation rate A2: Official interest rate A3: Official exchange rate A4: Economic stability A5: Monetary policy A6: Fiscal policy
	B: Political	B1: Political stability B2: State popularity B3: State support
	C: Social and cultural c	C1: Social support C2: Social-environmental linkage C3: Higher education level of population
	D: Infrastructural	D1: Legal framework, D2: Limited application to international standard D3: Institutional infrastructure D4: International cooperation in GB

Source: Authors' compilation from opinions of experts.

5.2 Step 2: Criteria Pairwise Comparison

The group of experts made their comparative judgments for each pair of criteria, the inputs analyzed to determine the relative priority of criteria. The findings, represented in Table 5, indicate that among four criteria, the experts emphasized infrastructural (D) and economic criteria (A), while they thought political (B) and social and cultural criteria (C) the least influential criteria for GB market development in Viet Nam.

Table 5: Comparing Relative Importance with Respect to Goal: GB Market Development

	A: Economic	B: Political	C: Social and Cultural	D: Infrastructure	Weight
A: Economic		3.0	6.0	–2.0	0.338
B: Political			2.0	–3.0	0.132
C: Social and cultural				–5.0	0.070
D: Infrastructure					0.461

Note: Inconsistency rate is 0.03.

Source: Authors' compilation from Expert Choice 10.

5.3 Step 3: Factors Pairwise Comparison

In this step, the group of experts conducted pairwise comparisons to determine the importance of factors (sub-criteria) associated with each criterion. The results of the pairwise comparisons are listed in Tables 6 to 9.

Table 6: Comparing the Relative Importance with Respect to A: Economic Criterion

	A1	A2	A3	A4	A5	A6	Weight
A1		2.0	1.0	4.0	–4.0	2.0	0.198
A2			2.0	4.0	2.0	3.0	0.249
A3				–0.2	–3.0	–2.0	0.087
A4					–3.0	–2.0	0.074
A5						3.0	0.291
A6							0.102

Note: Inconsistency rate is 0.05.

Source: Authors' compilation from Expert Choice 10.

Regarding factors of A (economic criterion), the pairwise comparison results, listed in Table 7, show that among economic criteria, monetary policy (A5) and interest rate of GB (A2) are the most important accelerators for developing the GB market in Viet Nam, whereas economic stability (A4) and exchange rate (A3) have the least influential weights (0.074 and 0.087, respectively).

Table 7: Comparing the Relative Importance with Respect to B: Political Criterion

	B1	B2	B3	Weight
B1		–0.2	–0.4	0.143
B2			–2.0	0.286
B3				0.571

Note: Inconsistency rate is 0.00.

Source: Authors' compilation from Expert Choice 10.

Pairwise comparisons of sub-criteria of B (political criterion) reveal that Viet Nam's state support of the GB market, with a relative weight of 0.571, is the most important factor among all political sub-criteria, while political stability (B1) is the least influential factor for developing GB in Viet Nam.

Table 8: Comparing the Relative Importance with Respect to C: Social and Cultural Criterion

	C1	C2	C3	Weight
C1		–0.3	–0.2	0.163
C2			2.0	0.540
C3				0.297

Note: Inconsistency rate is 0.00.

Source: Authors' compilation from Expert Choice 10.

Analyzing the pairwise comparisons conducted by the group of experts on the social and cultural criterion (C) shows that a stronger social-environmental linkage in Viet Nam's society (C2) is the most important factor for developing the GB market in Viet Nam, while social support (C1) for GB has the smallest relative weight (0.163) among the criteria.

Table 9: Comparing the Relative Importance with Respect to D: Infrastructure

	D1	D2	D3	D4	Weight
D1		4.0	2.0	2.0	0.431
D2			–0.2	2.0	0.175
D3				–0.2	0.193
D4					0.200

Note: Inconsistency rate is 0.02.

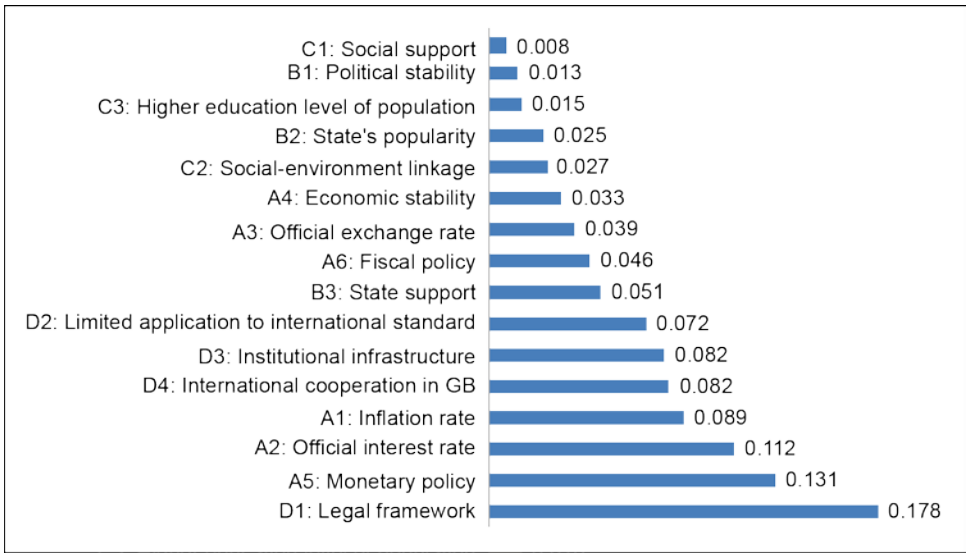
Source: Authors' compilation from Expert Choice 10.

In respect of the most important criterion (D: Infrastructural factors), conducting pairwise comparisons of its associated factors show that the legal framework (D1) and Viet Nam's international cooperation on GB (D4) have the highest relative weights, while limited application to international standard (D2) is the least important infrastructural factor, with a relative weight of 0.175.

5.4 Step 3: Global Ranking

In sub-section 5.3, the relative weights of factors associated with each criterion are achieved. Now we calculate the overall ranking of these factors with respect to the goal, which is developing the GB market in Viet Nam. The results of the global ranking of factors are shown in Figure 1.

Figure 1: Overall Weights of Factors with Respect to the Goal



Note: Consistency index is 0.08.

Source: Export Choice output.

As shown in Figure 1, among the 16 factors in four criteria, legal framework (D1), with a weight of 0.178; monetary policy of Viet Nam's central bank (A5), with a weight of 0.131; and interest rate of GB in Viet Nam (A2), with a weight of 0.112, are the most important factors influencing GB market expansion in Viet Nam, while some factors such as political stability (B1), with a weight of 0.013, and social support of GB in Viet Nam (C1), with a weight of 0.008, are the least important influencing factors for expanding the use of GB in Viet Nam. Based on these findings, it can be stated that infrastructural factors and economic factors are more important than political factors and social and cultural factors in developing the GB market in Viet Nam.

6. CONCLUSIONS AND POLICY IMPLICATIONS

In this study, we considered the green bond market developing in Viet Nam. To this end, we used a multi-criteria decision-making method called the analytic hierarchy process to evaluate and rank criteria and their associated factors influencing the development of GB in Viet Nam. We asked ten East Asia experts from the University of Tehran to do pairwise comparisons and then analyzed their decisions using Expert Choice software.

The main concluding remarks from the AHP are as follows.

i. Among four major criteria—namely economic, political, social and cultural, and infrastructural—infrastructural and economic factors have the most important role in developing the GB market in Viet Nam. This finding is in line with Sharma (2001) and Mu, Phelps, and Stotsky (2013), who determine the importance of infrastructural and economic factors on the spread of bonds in an economy.

ii. Regarding the economic criterion, the presence of an efficient monetary policy and a high GB interest rate are important in developing the GB market in Viet Nam. The importance of interest rate to expanding the GB market is in line with Barr and Campbell (1997), Viceira (2012) and De Rezende (2017), while our finding of a major role of monetary policy in developing the bond market is similar to the findings of Nimark (2008) and Marfatia (2015), who emphasize the effect of an efficient monetary policy on establishing a stable finance atmosphere in an economy.

iii. It can be concluded that Viet Nam's government support of the GB market is important, among different political factors. This is in line with Voica, Panait, and Radulescu (2015), who express that governments have realized the need for adaptation to new climate conditions. Therefore, governments' efforts and investments in green bonds are crucial for GB development.

iv. Social concerns about environmental matters are key to develop the GB market in Viet Nam. Environmental concern on the part of society—in other words, social environmental responsibility—can accelerate the interest of the population in entering and investing more in the GB market. This conclusion is in line with the findings of Li et al. (2017) and Trompeter (2017), who find positive linkages between environmental responsibility and financial performance.

v. Among infrastructural factors, the legal framework and Viet Nam's international cooperation on GB issues are the most important influential factors for GB market development in Viet Nam. A legal framework is an essential requirement to expand the GB market, making a stable and reliable investment climate for investors in this market. The remarkable correlation between the legal framework and GBs has been expressed in different studies, such as those by Shishlov, Morel, and Cochran (2016) and Park (2018).

vi. Considering all 16 influential factors related to economic, political, social and cultural, and infrastructural criteria revealed that the most important influencing factors among are a legal framework for GB operations, monetary policies of Viet Nam's central bank, and the official interest rate of GB. In other words, infrastructural and economic factors are more important requirements to develop the current GB market in Viet Nam than political and social and cultural requirements.

Overall, it can be seen that a demand is opening up the potential for vigorously promotion of the GB market in Viet Nam. Coordination between public and private, the domestic and foreign sectors, and linkage between financial institutions, banks and enterprises, and technology solution providers are essential to maximize resources for the development of a clean and sustainable economy. In addition to the pilot issuance of green local government bonds, the authorities should work together to develop a comprehensive plan to implement GB issuance in accordance with international practices in Viet Nam. Accordingly, there should be a legal document at the level of a government decree on the GB program which stipulates the purpose of using capital from bond issuance, the mechanism of accounting capital from bond issuance, reporting on the use of capital, and tax policy as a basis for implementation.

GB is not the answer to all issues of sustainable development in Viet Nam; however, GB is likely to be a springboard for sustainable development initiatives and solutions. With GB, we no longer have to consider selecting between economic development and environmental protection. We can encourage businesses, that have the highest emissions in the economy, to move toward self-mitigating and eliminating negative impacts on the environment while ensuring their profitability; or local communities will have the opportunity to participate in the economic system, and not only increase their income, but also enjoy an improved quality of life. When Viet Nam builds itself a professional GB market, it will create a new transition in the socio-economic foundation. Viet Nam has a lot of potential for issuing GB, but the challenges and barriers are significant. The article has pointed out some policy barriers (the policy system is not complete as a legal basis for participation in the market of issuers), including complicated and prolonged administrative procedures in terms of debt limits and issuance scale (small limit and scale), while environmental assessment and reporting have not been implemented properly

In future research, it is recommended to use quantitative methods to evaluate the magnitudes of effects of different variables on the GB market in Viet Nam. Furthermore, a comparison study between Viet Nam and other cases in which the GM market operates is suggested for future research.

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